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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20545

FAX NO'S 301 - FTS - 504-2260
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VERIFICATION NO. 301 - 504-2262

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1.	RANDY STURGEON	EPA-REGION III
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	FAX #	VERIFICATION
5.		
	FAX #	VERIFICATION

NUMBER OF PAGES 14 AND COVER SHEET

FROM MICHAEL WETTER PHONE EXT. (301) 504-1298

RE: REQUESTED INFO ON THORIUM DISORDERS;

SEE ESPECIALLY:

(1) Pg. 6 of
(2) Pg. 4 of

10/16/81 Application
10/30/84 Application

AR321383



E. I. DU PONT DE NEMOURS & COMPANY

INCORPORATED

WILMINGTON 98, DELAWARE

PURCHASING DEPARTMENT

October 16, 1961

Mr. Lyall Johnson (4)
Chief-Licensing Branch
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Sir:

Pursuant to the Atomic Energy Act of 1954 and Section 40.21 of the Code of Federal Regulations, Title 10 Atomic Energy, Chapter 1 Part 40, the Du Pont Company desires a specific license for its Newport Plant located at Newport, Delaware, authorizing the use of Thorium Salts as described in subsequent paragraphs.

Dispersion Modified MetalsGeneralMaterial Requested

Thorium salts, including Thorium Nitrate and Thorium Oxalate.

Quantity

A maximum of 1,000 pounds per year Thorium content.

Weight %

33 to 48% Thorium in Thorium Nitrate and 45 to 56% Thorium in Thorium Oxalate, depending on the degree of water of crystallization.

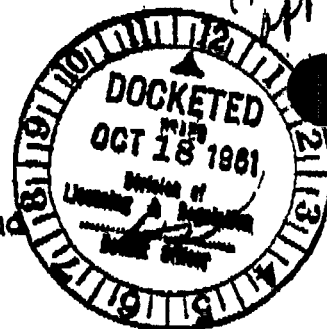
Form

Crystals

Quantity on Hand

300 pounds of Thorium total, but not exceeding the following in each category:

Raw Material - 150 lbs. of Thorium as a Thorium Salt
Processing Equipment - 20 lbs. of Thorium
Sub-finished Products (Temporary Storage) - 50 lbs.
of Thorium
Products - 150 lbs. of Thorium



AR321384

Letter - Notice sent O. P. R.
10/18

ack'd this letter sent for 40-6513 for info only because of p. 2

mining department

October 16, 1961

Mr. Lyall Johnson

Intended Use

Dispersions of Thorium Oxide in metal.

Facilities

The processing operation will be carried out in an area which is used only for this work. The area is about 25' x 40'. It is part of a brick building having a concrete ground floor. The area has several working levels. Initially, we will use only the ground level and the first elevated level. The latter will have steel flooring with floor drains and splash panels, so installed that the area can be hosed down.

The operation which is being installed in this area is being transferred from the du Pont Experimental Station where it has been active during the past year. We have measured the radiation exposure of the men on the job at the Station, and find that the annual dosage is less than 0.5 rem. For this reason, we propose to operate the area at Newport as an unrestricted area. If we find that exposure for any employee begins to approach 0.5 rem/year, then we will restrict the area.

Except for Thorium-containing products in transit, and small quantities of samples used in laboratory analyses, all raw materials and Thorium-containing products will be stored in locked cabinets.

Vented Area

The building will contain a general heating and ventilating system. Total intake will be approximately 9000 cu.ft./min., which represents an average of about 20 changes per hour in the building.

Storage

Locked cabinets will be provided for holding closed containers of raw materials, semi-finished, and finished products.

Equipment

Processing

The processing equipment installed in the building will be tanks for dissolving, mixing and reacting the Thorium salt with metal salts, a plate and frame filter press, a calcining oven, a combination drying and calcining oven for mixed precipitates, grinding equipment, and a controlled atmosphere furnace. In addition, other laboratory-type equipment will be employed. Appendix A provides information on the use of this equipment.

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October 16, 1961

Mr. Lyall Johnson

Hood

A hood will be installed so that the calcined Thorium Oxide can be transferred manually without exposing the operator to a local concentration of dust. Air passage through this hood will be about 2000 cu.ft./min. The calcining furnace will be installed in another hood. The total quantities of air passing through this latter hood will be approximately 1000 cu.ft./min.

The Thoria powder being transferred has the following screen analysis:

Greater than 20 mesh	-	0.8%
28 - 40 mesh	-	7.5%
40 - 60 mesh	-	2.2%
60 - 100 mesh	-	1.8%
100 - 200 mesh	-	60.4%
200 - 324 mesh	-	20.8%
Less than 325 mesh	-	6.5%

This material is transferred to a vessel where it can be mixed with water and subsequent operations are performed with a wet, non-dusting product.

The vents from the hood will be discharged to the atmosphere approximately 80 feet above the ground. Present experience indicates that less than 1 microcurie of Thorium will be lost per day from this point, and this quantity will be sufficiently diluted with vented air that air filters are not expected to be required. However, the air in the ducts leaving each hood will be monitored for particulate matter, and if extensive concentrations are encountered, an American air filter, type A (99.97% less than 0.3 micron) or its equivalent will be installed.

Dry Box

None required.

Filters

All mother liquors before being discarded will be processed through either a plate and frame filter press, or a Nutsche filter, after first being treated to precipitate excess quantities of Thorium. See also above considerations for using filter on hood vent.

Respirator Protection

The operations will not require the use of respirators.

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4 (continued)

October 16, 1961

Lyall Johnson

Storage Containers

Dried and finished and semi-finished products will be stored in metal containers (pint, quart, gallon, and 5 gallon paint cans). Raw materials (Thorium salt) will be stored in containers received from the vendor. Samples containing 5 or less microcuries of Thorium may be retained for analytical purposes in closed glass bottles.

Handling

All raw materials and products in containers will be moved manually. Normally, all Thorium containing materials will be handled without direct body contact. Exception will be laboratory samples which have been consolidated to dense forms.

Instruments

Beta and Gamma Monitoring

Nuclear Measurements Corporation Geiger Counter, GS-3L or equivalent will be employed.

Alpha Particulate Matter

Particulate matter emitting alpha particles will be counted by Nuclear Measurements Corp. Proportional Counter, PC-3A, or equivalent.

Neutrons

None required.

Air Samplers

Eight samplers will be employed to monitor the air continuously at various points, including: at working level, in front of hood; at working level near the center of operations in the room; and in exhaust from the hood. Samplers will consist of Gelman filter, holder No. 1200-A, using 2" Gelman Glass Filter Paper, type E or equivalent. Air at the rate of 1.0 cubic feet per minute will be drawn through each filter, using a Bell and Gossett air pump, number SYC 18-1, or equivalent.

Scaler

The alpha counting instrument above includes a scaler.

Fluorimeters

The Thorium content of the final products and intermediate products will be established by X-ray fluorescence, using a Phillips OEG-50 X-ray unit.

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October 16, 1961

Mr. Lyall Johnson

Administrative Procedure

Initial operation of the process facilities will be done by engineers and laboratory assistants. The normal complement will be 2 to 4 persons per shift. Initially, only one shift operation per day is anticipated, but facilities will accommodate 24 hr. per day operation. Personnel to be involved have had laboratory experience in handling both hazardous chemicals, and the engineers have had experience in handling laboratory quantities of Thorium.

Standard operating procedures and safety considerations will be written for the use of each of the major pieces of equipment, and each person in the area will be trained to use and follow the procedures. A written operating log will be kept.

Supervision of the entire operation will be by technically trained personnel. All changes in operation, safety procedures, and written procedures must receive their approval.

Radiation Protection

Because the Thorium will normally be handled in lots of 10 lbs. or less, special protection facilities will not be required for the shipping, handling, and processing of the product. (Part 20.20 3f.)

Radiation Survey Procedures

Radiation Levels

Will be monitored with a Geiger counter.

Contamination

Will be checked by the use of a Geiger counter, and/or a wipe test, using a PC-3 proportional counter. *Frequency*

Air Samples

See section on air samplers, under Instruments.

Effluents

Air effluents - see air samplers under Instruments. Thorium content of precipitates and mother liquors will be established by assay process (X-ray and wet chemical for each step).

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October 16, 1961

Mr. Lyall Johnson

Leak Testing

Visual inspection of equipment.

Personnel Monitoring

Film Badges

Film badges will be issued to each worker assigned to the area. The films will be processed on a once-per-week and once every three months basis, using Tracerlabs' film badge service or equivalent.

Dosimeters

None will be required.

Urine Analysis

Will be done for Thorium once per year.

Waste Disposal

Estimated Quantity

500 lbs. per year.

Methods

Two general methods of waste disposal will be employed; burial and discharge to plant sewage and water effluent streams.

All solid or hemi-solid Thorium containing materials will be accumulated, stored, and periodically buried. Burial will be in the plant dump, located remotely at the far end of the plant.

All solutions containing Thorium will be normally treated chemically to precipitate as much of the Thorium as possible before discarding them. The resulting solutions will be emptied into the sewer on the plant. The resulting concentration of Thorium in these discarded solutions will be below detectable limits, and several orders of magnitude below those specified by AEC regulations, Part 20.

Spills will normally be picked up and discarded along with other solids, and the floor of the building will normally be washed down from time to time to remove trace quantities of material, and these will also be discharged into the plant effluent.

Less than 2 ^{micro}milliouries per day (18 grams) of Thorium are expected to be vented into the atmosphere from these facilities. All ventings will

APR 24 1962

October 16, 1961

Mr. Lyall Johnson

Laboratory analytical samples will also be buried.

Training and Experience Available

See sections on administrative procedures.

The Newport plant personnel are used to safety hazards of the type encountered with Thorium, for example. The plant has had many years of experience in complex chemical handling, including producing titanium from titanium chloride.

Appendix A gives the details of our process. This is submitted as an Appendix so that it can be maintained as confidential, since:

1) Public inspection does not seem to be required in the public interest, since the potential safety hazards have been fully covered.

2) The du Pont Company has gone to considerable expense in developing this process, and we are not yet in a position to disclose it publicly.

The du Pont Company fully appreciates that anyone receiving materials made as authorized by any license granted would be required to conform to the appropriate Federal Regulations governing source materials.

The potential for this use is approximately 500,000 pounds per year. We will request an amendment when quantities in excess of 1000 pounds per year are required.

This operation is similar to the one at our Belle Works. License 58 covers the work at Belle. My letter to you dated December 23, supplied information for this installation. It is expected that the being done at Belle will eventually be transferred to Newport. The License would be no longer required. When this change is to be will be advised and the changes, if any, required to the Newport will be requested.

Columbium Extraction

At our Newport plant, we have in progress a columbium from its ores. In this program we work with very low levels of Thorium. During the processing is concentrated. In this work, we have been operating since expiration date May 31, 1964.

We expect to continue with this program. Thorium will be buried, along with wastes from metal program.

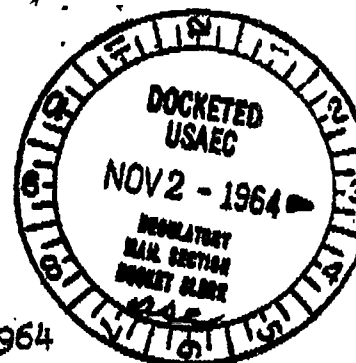
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E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
WILMINGTON 98, DELAWARE

PURCHASING DEPARTMENT

October 30, 1964



Mr. Donald A. Nussbaumer, Chief
Source and Special Nuclear Materials Branch
Division of Materials Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Attention: Mr. Robert L. Layfield

Ref: 40-6664 - License STB-489, As Amended

Dear Sir:

File Copy

Submitted herewith is application in quadruplicate for renewal of License STB-489, expiring November 30, 1964.

Your attention is directed to Appendix B which involves data of a confidential nature. We request that it be withheld from public inspection under the same conditions which now apply to Appendix A of our October 16, 1961 letter; Supplement I, transmitted with our August 7, 1962 letter and Supplement II, transmitted with our October 4, 1963 letter, as provided in Section 2.790, 10CFR2, "Rules of Practice". We reiterate our reasons as follows:

1. Public inspection does not seem to be required in the public interest, since the potential safety hazards have been fully covered.
2. Disclosure to the public of the proprietary information contained in Appendix B would be detrimental to the Du Pont Company.
3. The Du Pont Company has gone to considerable expense in developing this process, and we are not yet in a position to disclose it publicly.

If any additional information or clarification is required for approval of this request for renewal, please advise as soon as possible.

Very truly yours,

C. H. GILPIN
AUXILIARY SERVICES
SERVICES DIVISION

CHG:mfd
Attachments

(Appendix "B")
SEE SEPARATE FOLDER FOR MATERIAL WITHHELD
IN ACCORDANCE WITH SECTION 2.790 of PART 2

COPY PROVIDED
COMPLIANCE

11/5/64

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REGULATORY MAIL SECTION
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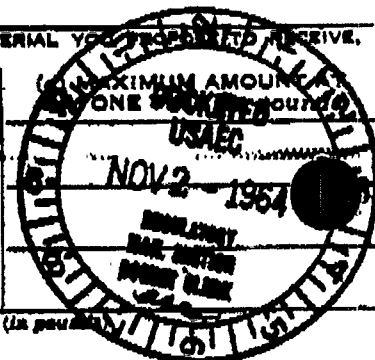
AR321391

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR SOURCE MATERIAL LICENSE

Pursuant to the regulations in Title 10, Code of Federal Regulations, Chapter 1, Part 40, application is hereby made for a license to receive, possess, use, transfer, deliver or import into the United States, source material for the activity or activities described.

1. (Check one) <input type="checkbox"/> (a) New license <input type="checkbox"/> (b) Amendment to License No. _____ <input checked="" type="checkbox"/> (c) Renewal of License No. <u>STH-489</u> <input type="checkbox"/> (d) Previous License No. _____		2. NAME OF APPLICANT <u>E. I. du Pont de Nemours & Co., Inc.</u>	
3. PRINCIPAL BUSINESS ADDRESS <u>Wilmington, Delaware 19898</u>			
4. STATE THE ADDRESS(ES) AT WHICH SOURCE MATERIAL WILL BE POSSESSED OR USED <u>E. I. du Pont de Nemours & Co., Inc., Pigments Department, Newport, Delaware</u>			
5. BUSINESS OR OCCUPATION <u>Chemical Industry</u>		6. (a) IF APPLICANT IS AN INDIVIDUAL, STATE CITIZENSHIP (b) AGE	
7. DESCRIBE PURPOSE FOR WHICH SOURCE MATERIAL WILL BE USED <u>Production of dispersion modified metals and associated research.</u>			
8. STATE THE TYPE OR TYPES, CHEMICAL FORM OR FORMS, AND QUANTITIES OF SOURCE MATERIAL YOU PROPOSE TO RECEIVE, POSSESS, USE, OR TRANSFER UNDER THE LICENSE			
(a) TYPE	(b) CHEMICAL FORM	(c) PHYSICAL FORM (Including % U or Th.)	(d) MAXIMUM AMOUNT AT ANY ONE TIME
NATURAL URANIUM			
URANIUM DEPLETED IN THE U-235 ISOTOPE			
THORIUM (ISOTOPE)	<u>See supplemental sheets</u>		
(e) MAXIMUM TOTAL QUANTITY OF SOURCE MATERIAL YOU WILL HAVE ON HAND AT ANY TIME (in pounds) <u>5,000 lbs.</u>			
9. DESCRIBE THE CHEMICAL, PHYSICAL, METALLURGICAL, OR NUCLEAR PROCESS OR PROCESSES IN WHICH THE SOURCE MATERIAL WILL BE USED, INDICATING THE MAXIMUM AMOUNT OF SOURCE MATERIAL INVOLVED IN EACH PROCESS AT ANY ONE TIME, AND PROVIDING A THOROUGH EVALUATION OF THE POTENTIAL RADIATION HAZARDS ASSOCIATED WITH EACH STEP OF THOSE PROCESSES. <u>See supplemental sheets</u>			
10. DESCRIBE THE MINIMUM TECHNICAL QUALIFICATIONS INCLUDING TRAINING AND EXPERIENCE THAT WILL BE REQUIRED OF APPLICANT'S SUPERVISORY PERSONNEL INCLUDING PERSON RESPONSIBLE FOR RADIATION SAFETY PROGRAM (OR APPLICANT IF APPLICANT IS AN INDIVIDUAL). <u>See supplemental sheets</u>			
11. DESCRIBE THE EQUIPMENT AND FACILITIES WHICH WILL BE USED TO PROTECT HEALTH AND MINIMIZE DANGER TO LIFE OR PROPERTY AND RELATE THE USE OF THE EQUIPMENT AND FACILITIES TO THE OPERATIONS LISTED IN ITEM 9; INCLUDE (a) RADIATION DETECTION AND RELATED INSTRUMENTS (including film badges, dosimeters, counters, air sampling, and other survey equipment as appropriate. The description of radiation detection instruments should include the instrument characteristics such as type of radiation detected, window thickness, and the range(s) of each instrument). <u>See supplemental sheets</u>			
(b) METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED IN (a) ABOVE, INCLUDING AIR SAMPLING EQUIPMENT (for film badges, specify method of calibrating and processing, or name supplier). <u>See supplemental sheets</u>			



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8. Source Material(a) Type: Thorium natural

NOTE: All subsequent weights are quoted in terms of contained thorium.

(b,c,d) Thorium nitrate, containing 33 to 48% thorium (depending on the amount of water of crystallization), 1,000 pounds maximum.

Thorium oxalate, containing 45 to 56% thorium (depending on the amount of water of crystallization), 1,000 pounds maximum.

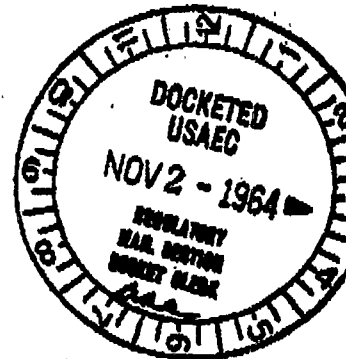
Sub-finished products (temporary storage), 2,000 pounds maximum. (See Appendix B for description.)

Dispersion-modified metals, containing 0.01-20% thorium, 2,000 pounds maximum.

(e) Maximum total quantity of source material on hand at any one time: 5,000 pounds.

9. A,B,C,D (See Appendix B)E. Storage

This item is covered under Items 1 and 2, C. R. Whitcombe to D. A. Nussbaumer, dated October 4, 1963.



10. The minimum technical qualifications required for the person responsible for the radiation safety program are:
- (a) a bachelor's degree in chemistry, physics or chemical engineering from an accredited college or university,
 - (b) completion of the formal course in "Safe Handling of Radioisotopes" conducted by the Du Pont Engineering Department, or equivalent formal instruction.

The minimum technical qualifications required for direct supervisory personnel are: (a) two years of college training in chemistry or the equivalent, and (b) on-the-job training, including familiarity with all parts of the area safety regulations, the radiation safety portions of which emphasize the job requirements for safe operation and compliance with 10CFR20.

AR321393

11. (a) Tracerlab film badges are used. These badges have a minimum sensitivity of 30 mrem beta and mrem gamma.

Nuclear Measurements Corporation beta-gamma survey meter, Model GS-3L, or equivalent is used to monitor restricted areas and adjoining unrestricted areas to be sure that radiation levels do not exceed permissible limits. A survey meter is also used to establish the beta-gamma radiation levels at the surfaces of containers filled with product, so that the containers can be marked in compliance with AEC and ICC regulations.

Airborne thorium is monitored in appropriate locations by drawing air at known rates through Gelman filters, Holder No. 120C-A, using 2" diameter Gelman filter paper, Type E or equivalent. Air is drawn by 1.0 cfm Bell & Gossett air pumps, Model SYC 18-1 or equivalent.

Smear samples and air filter samples are counted for alpha radiation using Nuclear Measurements Corporation windowless proportional counter, Model PC-3A, or equivalent with scaler.

- (b) Film badges are processed by Tracerlab, a division of Laboratory for Electronics, Inc., or by some other reputable commercial laboratory which specializes in this type of work.

The beta-gamma survey meters are calibrated weekly against self-contained uranium standards.

The windowless alpha-counters and scalars are calibrated monthly against a purchased two-dimensional, alpha-emitting standard.

The rate of flow through each dust filter is calibrated weekly by inserting a Gelman rotameter, calibrated in liters per minute, in the line during actual operation.

- (c) The small-scale experimental Dispersion-Modified Metals semiworks area is the same as it was as licensed under STB-489, dated December 4, 1961, as amended by Item 1., paragraph 3, of the letter from H. J. Gorman, Jr. to J. C. Delaney, dated July 20, 1962. (Special reference is made, in our license application dated October 16, 1961, to sub-headings titled Facilities, Vented Area and Hood, and to the "Amendment to Appendix A,"

11. (c) - Cont'd.

(ated November 20, 1961.) An additional 1200 cfm ventilating blower has been installed in the area, bringing the total ventilation to 10,200 cfm, in addition to the facility described in the November 20, 1961 "Amendment to Appendix A."

Supporting research continues to be performed in laboratories, with small samples, as described in Item 3, paragraph 3, of the letter from H. J. Gorman, Jr. to J. C. Delaney, dated July 20, 1962.

For further information see Appendix B.

12. (a) In all of the process, there are no unusual hazards. (A single exception is covered in Appendix B.) Materials of construction are non-flammable. In general, we operate in harmony with well-known, stringent, safety and fire protection standards which prevail throughout the Du Pont Company and are rigidly enforced through line supervision, as well as by periodic surveys and on-the-spot inspections by the Company's central Safety and Fire Protection Division.

A running inventory of all source material is maintained. It is checked and certified monthly by the Radiation Protection Officer.

- (b) The most likely accident is a spill. If a spill of over 100 g. ThO_2 (90 g. Th) occurs, area supervision must be notified so that proper cleanup, verified by smear tests, is assured. If visible dust occurs, the building is evacuated until the ventilating system clears the air.

In the case of major fire, in which the plant fire brigade is called, area personnel advise the fire brigade. All reactive gas flows and all electric power to the building are cut off. All persons entering the area during a fire must wear Air-Pak masks or equivalent, as protection against inhalation of thorium-bearing dust.

- (c) Dust Sampling - This is the main part of our monitoring program. Experience to date has shown potential ingestion as dust (approach to 10CFR20's RCG levels) as the only radiological hazard of this operation. Dust samples are collected continuously in all areas, read for permanent alpha-count rate daily in restricted

12. (c) - Cont'd.

areas and weekly in unrestricted areas. This sampling is done in all areas where dry, thoriated material is handled, except the small laboratory hoods, and including all points where dust can be ejected from our area. A total of fifteen dust samplers are now in use; this number may vary slightly from time to time as our experience dictates, or as a temporary experimental unit is built or dismantled.

Film Badges - Film badges are used for all personnel assigned to and working regularly in areas where thorium compounds are used in the production or storage of dispersion-modified metals. They are also used by selected personnel working with experimental quantities on a laboratory scale. The badges are read on a monthly basis. So far, they show no exposure to significant amounts of beta-gamma radiation.

Smear Tests - Smear tests are taken weekly in all areas, and daily at random locations in operating areas. The specimens are read for alpha count rate, to serve as a check on the effectiveness of cleanup procedures. (For details, see paragraph 4, H. J. Gorman, Jr. to D. A. Nussbaumer, dated August 7, 1962.) Cleanup is now required if smear sample counts exceed one count/min./cm².

Beta-gamma surveys of radiation levels are made weekly in operating and storage areas. This supplements the film badge service.

USAEC Inspection - Attention is drawn to the fact that these procedures were judged to be adequate by the Division of Compliance, U.S.A.E.C., on the occasion of an on-site inspection on November 12, 1963, during which no item of noncompliance was found.

13. (a) It is possible that up to 2,000 pounds per year of waste thorium may be disposed of by burying. A very small fraction of this could be raw material salts, but almost all of it would be thorium dispersed in intermediates or in metal as product. Most of it will be in the form of sludge or powders, chemically unreactive, and will be buried in accordance with 10CFR20.304.

A small part of the waste is aqueous effluent, overflowing from a settling tank, (see Par. 3, Supplement II to Appendix A, letter from C. R. Whitcombe to D. A. Nussbaumer, dated October 4, 1963, see also Par. 5, H. J. Gorman, Jr. to D. A. Nussbaumer, dated August 7, 1962, and Par. 3, H. J. Gorman, Jr. to D. A. Nussbaumer, dated August 16, 1962). Thus effluent is sent to sanitary sewers in accordance with 10CFR20.303 and 10CFR20.106.

AR321397